(Our Ref: US-15P188)

PROCESS CARTRIDGE, ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS, AND PROCESS CARTRIDGE MOUNTING SYSTEM

FIELD OF THE INVENTION AND RELATED ART

The present invention relates to a process cartridge which is detachably mountable to a main body of an electrophotographic image forming apparatus such as a copying machine or a laser beam printer (LBP), an electrophotographic image forming apparatus to which this process cartridge is detachably mounted, and a process cartridge mounting system.

Note that the process cartridge is provided with an electrophotographic photosensitive member and at least one process means. Here, examples of the process means include charging means which charges the electrophotographic photosensitive member, developing means which develops an electrostatic latent image formed on the electrophotographic photosensitive member, and cleaning means which cleans a toner remaining on the electrophotographic photosensitive member.

Conventionally, in an image forming apparatus of an electrophotographic process such as a small-sized copying machine or a laser beam printer (herein after referred to as LBP), a process cartridge constituting an image forming section thereof is set detachably mountable to a main body of the apparatus, whereby it is possible to replace the process cartridge (e.g., JP 08-106207 A, USP 5,907,751, and USP 5,943,529).

Here, the electrophotographic image forming apparatus is constituted such that only a designated specific process cartridge

can be properly mounted to the apparatus.

That is, the process cartridge or the main body of the apparatus is constituted to have cartridge non-interchangeability for not allowing an undesignated process cartridge to be mounted to the apparatus even if an attempt is made to mount the undesignated process cartridge (e.g., USP 5,911,096).

This is realized because, in an image forming apparatus of a specification, a type, or the like different from another image forming apparatus, a process cartridge to be used therefor has different functions and thus, the process cartridge is suitable for image formation in the other apparatus.

If an incompatible process cartridge is mounted by mistake, satisfactory image formation is not performed.

Thus, conventionally, there has been known a method of using a sensor for judgment of interchangeability, a method of making an image forming apparatus engageable only with a driven gear of a conformable process cartridge, or the like.

However, if the sensor for judgment of interchangeability is used, an expensive sensor for judgment of interchangeability is required. Further, it is also necessary to attach a component for operating the sensor for judgment of interchangeability on the process cartridge side. Accordingly, an increase in cost is caused.

In addition, if the image forming apparatus is constituted to be given non-interchangeability depending upon whether the gear engages or not, since interchangeability is judged in the vicinity of a proper position of the process cartridge, timing for judging

interchangeability is delayed.

SUMMARY OF THE INVENTION

The present invention has been devised in view of the above-mentioned related art. It is an object of the present invention to provide a process cartridge, an electrophotographic image forming apparatus, and a process cartridge mounting system which have a non-interchangeable function. It is another object of the present invention to provide a process cartridge, an electrophotographic image forming apparatus, and a process cartridge mounting system which reliably have a non-interchangeable function with a simple structure while sharing components of a process cartridge frame. It is another object of the present invention to provide a process cartridge, an electrophotographic image forming apparatus, and a process cartridge mounting system which have a projecting portion which is provided in the cartridge frame and, when the process cartridge is mounted to the main body of the electrophotographic image forming apparatus, is guided to the guide member to guide the process cartridge in a mounting direction in which the process cartridge is mounted to the main body of the electrophotographic image forming apparatus, wherein, when the process cartridge is mounted to the main body of the electrophotographic image forming apparatus which is conformable in functions of the process cartridge, the projecting portion allows the process cartridge to insert the main body of the electrophotographic image forming apparatus and, when the process cartridge is mounted to a main body of an electrophotographic

image forming apparatus which is unconformable in functions of the process cartridge and having different functions, the projecting portion abuts against a main body frame provided in the main body of the electrophotographic image forming apparatus having different functions to prevent mounting of the process cartridge.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a sectional view showing a schematic structure of an electrophotographic image forming apparatus;

Fig. 2 is a perspective view showing the vicinity of an open/close cover of the electrophotographic image forming apparatus;

Fig. 3 is a sectional view showing a schematic structure of a process cartridge;

Fig. 4 is a perspective view of the process cartridge;

Fig. 5 is a perspective view of the process cartridge;

Fig. 6 is a perspective view of a process cartridge of another embodiment;

Fig. 7 is a perspective view of a process cartridge mounting/dismounting mechanism;

Fig. 8 is an explanatory view of an inserting operation of the process cartridge into the process cartridge mounting/dismounting mechanism shown in Fig. 7;

Fig. 9 is an explanatory view of the inserting operation of the process cartridge into the process cartridge

mounting/dismounting mechanism shown in Fig. 7;

Fig. 10 is an explanatory view of the inserting operation of the process cartridge into the process cartridge mounting/dismounting mechanism shown in Fig. 7;

Fig. 11 is an explanatory view of the inserting operation of the process cartridge into the process cartridge mounting/dismounting mechanism shown in Fig. 7;

Fig. 12 is an explanatory view of the inserting operation of the process cartridge into the process cartridge mounting/dismounting mechanism shown in Fig. 7;

Fig. 13 is an operational explanatory view showing a movement of the process cartridge associated with a closing operation of the open/close cover;

Fig. 14 is an operational explanatory view showing a movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 15 is an operational explanatory view showing the movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 16 is an operational explanatory view showing the movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 17 is an operational explanatory view showing the movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 18 is an operational explanatory view showing the movement of the process cartridge associated with the closing

operation of the open/close cover;

Fig. 19 is an operational explanatory view showing the movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 20 is an operational explanatory view showing the movement of the process cartridge associated with the closing operation of the open/close cover;

Fig. 21 is a main sectional view showing an image forming apparatus having different functions to which the process cartridge in accordance with an embodiment is attempted to be inserted; and

Fig. 22 is a main sectional view showing an image forming apparatus in accordance with the embodiment to which improper process cartridge is attempted to be inserted.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Next, an embodiment in accordance with the present invention will be described in detail with reference to the accompanying drawings. A laser beam printer will be described as an embodiment of an image forming apparatus, a process cartridge and a process cartridge mounting system.

In the following description, a longitudinal direction of the process cartridge refers to a direction crossing (substantially perpendicular to) a mounting and dismounting direction of the process cartridge with respect to a main body of the image forming apparatus. Alternatively, the longitudinal direction refers to a direction parallel with a surface of a recording medium and crossing (substantially perpendicular to) a conveying direction

of the recording medium. In addition, the left and right refers to the left and right of the recording medium viewed from a position above it in accordance with the conveying direction thereof. In addition, an upper surface of the process cartridge is a surface located at a top in a state in which the process cartridge is mounted to the main body of the apparatus, and a lower surface is a surface located at the bottom.

As an order of the description, first, an entire structure of the process cartridge and an electrophotographic image forming apparatus using the process cartridge will be described. Next, a structure of the process cartridge mounting system for mounting and dismounting the process cartridge to and from a main body of the electrophotographic image forming apparatus will be described. Then, lastly, a structure of an erroneous insertion preventing mechanism for an improper process cartridge will be described.

The process cartridge and the electrophotographic image forming apparatus to which the process cartridge is detachably mountable will be specifically described with reference to Figs. 1 to 3. Note that Fig. 1 is a schematic explanatory view of a structure of the electrophotographic image forming apparatus mounted with the process cartridge, Fig. 2 is an explanatory view showing the vicinity of an open/close cover of the electrophotographic image forming apparatus, and Fig. 3 is a schematic explanatory view of a structure of the process cartridge.

(Overall structure)

As shown in Fig. 1, an electrophotographic image forming apparatus A (laser beam printer, hereinafter referred to as "image

forming apparatus") irradiates information light, which is based upon image information from an optical system 1 serving as optical means, on an electrophotographic photosensitive drum 7 of a drum shape (hereinafter referred to as "photosensitive drum"). Consequently, the image forming apparatus A forms an electrostatic latent image on the photosensitive drum 7. Then, the image forming apparatus A develops this electrostatic latent image with a developer (hereinafter referred to as "toner") to form a toner image.

Then, in synchronization with the formation of the toner image, the image forming apparatus A separates and feeds a recording medium (recording paper, OHP sheets, cloth, etc.) 2 from a cassette 3a one by one with a pickup roller 3b and a press contact member 3c which is in pressed contact with the pickup roller 3b. Then, the image forming apparatus A transfers the toner image, which is formed on the photosensitive drum 7 provided in a process cartridge B, to the recording medium 2 by applying a voltage to a transfer roller 4 serving as transfer means. The image forming apparatus A conveys the recording medium 2 to fixing means 5 with a conveying guide 3f.

This fixing means 5 includes a drive roller 5a and a fixing rotary member 5b which contains a heater 5d and is constituted by a cylindrical sheet rotatably supported by a support member 5c. Then, the fixing means 5 applies heat and pressure to the recording medium 2 passing the fixing means 5 to fix a transfer toner image on the recording medium 2.

Then, the image forming apparatus A conveys the recording

medium 2 having this toner image fixed thereon with a delivery roller 3d. Thereafter, the image forming apparatus A delivers the recording medium 2 to a delivery section 6 through a reverse conveying path.

Note that, in this embodiment, conveying means 3 is constituted by the pickup roller 3b, the press contact member 3c, the delivery roller 3d, and the like.

A main body of the electrophotographic image forming apparatus (hereinafter referred to as "main body of the apparatus" or "main body") 14 includes the conveying means 3, the fixing means 5, and drive means for driving the process cartridge B. The drive means drives each rotary member by transmitting a drive force from a motor (not shown) serving as a drive source with a gear train (not shown).

A drive force is also transmitted to a large gear via the gear train (not shown) and, then, transmitted to the process cartridge B by this large gear. The transmission of the drive force between the large gear and the process cartridge B is carried out by coupling means described in USP 5903803.

The coupling means is constituted by a large gear coupling, which is formed coaxially with a rotary shaft of the large gear and has a twisted hole with a section of a substantially equilateral triangle shape, and a drum coupling 7a1 which is formed in a gear flange 7a fixed to one end of the photosensitive drum 7 coaxially with a rotary shaft of the photosensitive drum 7 and is formed in a twisted projected shape with a section of a substantially equilateral triangle shape. The transmission of the drive force

and aligning and positioning of the large gear and the photosensitive drum 7 are performed by coupling of this coupling means. Drive coupling means which performs coupling and release of this coupling means is also provided.

In addition, as shown in Fig. 2, a front guide 43, which has support holes 43a rotatably supporting pivotal center bosses 15a of an open/close cover 15, is fixed between left and right side plates 40.

In this front guide 43, side guides 43b, whose inner surfaces are set in longitudinal positions having a distance from each other the same as or closer than a distance between inner surfaces of moving guides 41 and which perform guiding of projecting portions 10f4 of the process cartridge B and guiding of a longitudinal direction position of the process cartridge B, and abutment ribs 43c, which abut against leg portions 10f3 of the process cartridge B on inner sides in the longitudinal direction than the side guides 43b, are provided two places in the vicinity of both ends in the longitudinal direction, respectively.

(Process Cartridge)

As shown in Figs. 3 to 5, the process cartridge B of this embodiment rotates the photosensitive drum 7 which is an electrophotographic photosensitive member having a photosensitive layer with the drive force received from the main body 14 of the apparatus. Then, A charging roller 8 serving as charging means is applied a voltage to uniformly charge the surface of the photosensitive drum 7. Then, the main body 14 irradiates information light (photo image), which is based upon image

information from the optical system 1, on the charged photosensitive drum 7 through an exposure opening 9b for exposure to form an electrostatic latent image on the surface of the photosensitive drum 7. Then, the developing means 10develops the electrostatic latent image.

The developing means 10 feeds a toner in a toner containing portion 10a with a rotatable feeding member 10b serving as toner feeding means. Then, the developing means 10 rotates a developing roller 10d serving as a developing rotary member (developer carrying member) containing a fixed magnet 10c. Then, the developing means 10 forms a toner layer, to which a triboelectric charge is applied, on the surface of the developing roller 10d with a developing blade 10e. Then, the developing means 10 forms a toner image by transferring the toner to the photosensitive drum 7 according to the electrostatic latent image to visualize the electrostatic latent image.

After applying a voltage of a polarity opposite to that of the toner image to the transfer roller 4 to transfer the toner image to the recording medium 2, A cleaning blade 11a scrapes off the toner remaining on the photosensitive drum 7. The scraped-off toner is scooped by a scoop sheet 11b and collected in a removed toner containing section 11c. In this way, the cleaning means 11 removes the residual toner on the photosensitive drum 7.

The process cartridge B described in this embodiment includes a cleaning frame 11d, which rotatably supports the photosensitive drum 7 and incorporates the cleaning means 11 and the charging roller 8, and a toner development frame 10f which incorporates

the developing member 10 and the toner containing portion 10a.

Further, the toner development frame 10f is pivotably supported with respect to the cleaning frame 11d such that the developing roller 10d of the developing means 10 can be opposed to the photosensitive drum 7 in parallel with a predetermined space between them. In addition, spacers (not shown) for keeping the space between the developing roller 10d and the photosensitive drum 7 are arranged at both ends of the developing roller 10d.

Holder members 10g are provided on both sides of the toner development frame 10f and have hanging arms, in which connection holes are formed, for rotatably hanging the toner development frame 10f to the cleaning frame 11d. A predetermined pressure is applied between the toner development frame 10f and the cleaning frame 11d in order to keep a space between them.

The cartridge B is formed by being housed in a cartridge frame CF constituted by combining: the toner development frame 10f, which is formed as a united body by welding a development frame 10f1 and a cover member 10f2, and the cleaning frame 11d.

Further, as shown in Figs. 4 and 5, mounting guides 18b for detachably mounting the cartridge B to the main body 14 of the apparatus in a direction of arrow X are provided on both sides in a longitudinal direction of this cartridge frame CF. In addition, positioning guides 18a, which are located coaxially with the rotary shaft of the photosensitive drum 7 and supported by positioning means in the image forming apparatus, are provided.

The positioning guides 18a are cylindrical bosses on the left and right having different sizes. A mounting assist guide

18a1 extended to the rear in the mounting direction of the cartridge B is provided in the guide 18a on a counter drive side (In the longitudinal direction of the cartridge B, the opposition side which the drum coupling 7a1 is provided). In addition, a biased portion 18a2 which is an arc coaxial with the guides 18a is provided at a rear end of this guide 18a1.

Lower surfaces 18b1, which are received by a moving guides 41 described later, and tip portions 18b2 that are tips of a mounting guides 18b in the inserting direction of the cartridge B are provided in the mounting guides 18b.

In these tip portions 18b2, arcs linked to the lower surfaces 18b1 are set larger than arcs linked with upper surfaces of the mounting guides 18b.

Slope portions 18b4 with an angle with respect to the lower surfaces 18b1 set as an acute angle are provided at rear end lower corners 18b3 that are rear end corners of the lower surfaces 18b1 in the inserting direction. In addition, perpendicular surfaces 18b5 perpendicular to the upper surfaces are provided at rear ends of the upper surfaces in the inserting direction.

Rear ends of the mounting guides 18b are provided up to the rear side of the cartridge B than a center of gravity position thereof. Consequently, when the cartridge B is supported by the mounting guides 18b, the cartridge B always keeps a posture inclined to the front. In this embodiment, the mounting guides 18b are provided on the sides of the cleaning frame 11d at a position above the positioning guides 18a.

In addition, leg portions 10f3 for allowing the cartridge

B to be placed stably on a desk are provided at longitudinal ends of the cover member 10f2. Moreover, extended shapes of the leg portions 10f3 are provided in holder members 10g provided on the outer side of the cover member 10f2.

As shown in Fig. 5, a projecting portion 10f4 (10f4a) is provided on the outer side of the leg portion 10f3 (10f3a) of the holder member 10g on the counter drive side which constitutes one end in the longitudinal direction of the cartridge B of this embodiment. The leg portion 10f3 (10f3a) and the projecting portion 10f4 (10f4a) at one end in the longitudinal direction of the cartridge B are integrally formed in a shape of one projection.

In addition, as shown in Fig. 5, a projecting portion 10f4 (10f4b) is provided on the outer side of the leg portion 10f3 (10f3b) of the holder member 10g on the drive side (In the longitudinal direction of the cartridge B, the same side which the drum coupling 7a1 is provided) which constitutes the other end in the longitudinal direction of the cartridge B. The leg portion 10f3 (10f3b) and the projecting portion 10f4 (10f4b) on the other end in the longitudinal direction of the cartridge B are also integrally formed in a shape of one projection.

Note that, in another embodiment, for example, as shown in Fig. 6, the projecting portion 10f4 (10f4b) may be provided across a gap on the outer side of the leg portion 10f3 (10f3b) of the holder member 10g on the drive side to form a leg portion of a forked shape.

In the cartridge B of this embodiment, a drum shutter 12, which can integrally cover a transfer opening 9a opposed to the

transfer roller 4 of the photosensitive drum 7 and an exposure opening 9b, is rotatably provided on the cleaning frame 11d.

A structure of the shutter 12 will be described. The shutter 12 includes a drum protecting portion 12a, a rotary shaft 12b, coupling portion 12c, a cam section 12d, and a rib 12e.

The protecting portion 12a can cover the transfer opening 9a where the photosensitive drum 7 abuts against the transfer roller 4.

The rotary shaft 12b is provided such that the shutter 12 is rotatably supported in the vicinity of the exposure opening 9b of the cleaning frame 11d. In the shaft 12b, there are provided a sliding portion 12b1, which slides with respect to the cleaning frame 11d at both ends of the rotary shaft 12b, a large diameter portion 12b2, which is thicker than the sliding portion 12b1 in parts covering the exposure opening 9b connecting the sliding portion 12b1 at both ends, and an exposure shutter portion 12b3, which blocks the exposure opening 9b in a state in which the shutter 12 is closed in the large diameter portion 12b2.

The coupling portion 12c are provided in left and right two parts connecting the protecting portion 12a and the shaft 12b at both ends of the protecting portion 12a and on the outer side of the large diameter portion 12b2 of the shaft 12b.

The cam portion 12d is arranged on the right side of the large diameter portion 12b2 of the shaft 12b and projects above the cartridge B.

The rib 12e is provided in the coupling portion 12c on the right side and extends to the outer side in the longitudinal

direction of the shutter 12. The rib 12e is received by a shutter guide 44c of a fixed guide 44 and keeps a posture with the shutter 12 opened.

A biasing force is applied to this shutter 12 in a direction in which the shutter 12 covers the photosensitive drum 7 by a spring force of a torsion coil spring (not shown).

Consequently, in a state in which the cartridge B is removed from the main body 14, the shutter 12 keeps covering to close the transfer opening 9a as indicated by alternate long and two dash lines of Fig. 3. In addition, in a state in which the cartridge B is in the main body 14 of the apparatus A and capable of performing an image forming operation, the shutter 12 is rotated by shutter opening/closing means described later, and takes a posture in which the transfer opening 9a is exposed and the photosensitive drum 7 and the transfer roller 4 are capable of abutting against each other as shown by solid lines of Fig. 3.

(Mounting of the process cartridge to the main body 14 of the apparatus A)

Next, an inserting operation of the cartridge B by a process cartridge mounting/dismounting mechanism serving as mounting means will be described with reference to Figs. 7 to 12.

When the open/close cover 15 of the main body 14 is completely opened (fully opened state), an opening W for mounting and dismounting the cartridge B appears. In this state, as shown in Fig. 7, the moving guides 41 appear in a posture in which they are receded to a depth side in the inserting direction of the cartridge B. Auxiliary guides 42 are fixed to the side plates 40

substantially symmetrically on an upstream side in the inserting direction of the moving guides 41. In addition, the front guide 43 described above is arranged below the opening W.

As described above, the cartridge B is provided with positioning guides 18a, which are formed coaxially with the rotary shaft of the photosensitive drum 7 on both the sides of the cartridge frame CF, and the mounting guides 18b of a rib shape provided along the mounting and dismounting direction of the cartridge B.

Moreover, the leg (projecting) portions 10f3 are provided in the vicinity of both the ends in the longitudinal direction on the lower surface of the toner development frame 10f, and the projecting portion 10f4 is provided on the outer side thereof.

An operation in accordance with an order of insertion in inserting the cartridge B from the opening W will be described.

The auxiliary guides 42 is caused to receive the mounting guides 18b and to function as rough guides for determining a position for inserting the cartridge B into the main body.

Moreover, when the cartridge B is inserted along the auxiliary guides 42, as shown in Fig. 11, the two projecting portions 10f4 abut against the side guides 43b, which are formed at both the ends in the longitudinal direction of the front guide 43, and are guided in such a manner that they mount onto the side guides 43b. Consequently, the cartridge B is inserted into the main body 14 in a stable posture.

In that case, the side guides 43b formed at both the ends in the longitudinal direction of the front guide 43 have a shape and are provided in a position so that the side guides 43b do not

abut against the leg portions 10f3 and the projecting portions 10f4 and do not prevent the insertion when the cartridge B is inserted, thereby guiding the projecting portions 10f4. Thus, the cartridge B is inserted into the main body 14 smoothly.

Thereafter, as shown in Fig. 12, the mounting guides 18b are received by the moving guides 41.

The moving guides 41 move to the inside of the main body 14 of the apparatus A in association with opening and closing operations of the open/close cover 15. Then, the cartridge B is mounted in a regular mounting position in the main body 14 of the apparatus A.

Since the moving guides 41 are set up to the rear side in the inserting direction than the center of gravity position of the cartridge B, the cartridge B takes a posture lifting the toner development frame 10f in which the cartridge B is on the rear side in the inserting direction when the mounting is completed.

Consequently, in a state in which the insertion of the cartridge B is completed, the cartridge B is supported on the lower side of the tip portions 18b2 of the mounting guides 18b by the depth side of receiving surfaces 41a1 of guide grooves 41a. Then, the rear end corners 18b3 of the mounting guides 18b are lifted.

The moving guides 41 have a function of moving the cartridge B to a predetermined position of the main body 14 of the apparatus A and moves in association with opening and closing operations of the open/close cover 15.

Consequently, if the rear ends of the moving guides 41 (side ends of the open/close cover) can be pushed by the cartridge B,

the moving guides 41 escape to the inside of the image forming apparatus A. Then, the mounting guides 18b of the cartridge B cannot be inserted into the guide grooves 41a of the moving guides 41.

Therefore, in this embodiment, the auxiliary guides 42, which are fixed to the side plates 40 and have mounting/dismounting assist portions 42a extending to the rear ends of the moving guides 41, are provided on the upstream side of the moving guides 41 in the mounting direction X of the cartridge B. The above-mentioned problems are solved by the auxiliary guides 42. Then, the mounting guides 18b are guided to the guide grooves 41a of the moving guides 41 reliably.

(Opening/closing mechanism for the drum shutter)

The state of inserting the cartridge B has been described. Next, opening and closing operations of the drum shutter 12 after the insertion will be hereinafter described.

In this embodiment, the opening and closing operations of the shutter 12 are not performed at a stage when the cartridge B is mounted to the main body 14of the apparatus A (Figs. 8 to 12) but are performed at a stage when the cartridge B moves in the inside of the main body 14 in accordance with the rotation of the open/close cover 15 (Figs. 13 to 20).

That is, the shutter 12 is opened and closed at the stage when the cartridge B is moved by an operation for closing the open/close cover 15.

The cartridge B moves in association with the closing operation of the open/close cover 15, whereby the shutter 12 rotatably supported by the cartridge B rotates. Then, the transfer

opening 9a and the exposure opening 9b are exposed to bring the cartridge B into a state in which an image can be formed.

More specifically, when the cartridge B moves in association with the closing operation of the open/close cover 15, as shown in Fig. 13, the cam portion 12d comes into contact with an optical plate 1f which is supported between the left and right side plates on which the optical system 1 is mounted in the main body 14. Then, the shutter 12 is rotated clockwise against a spring pressure of a shutter spring. Consequently, the transfer opening 9a and the exposure opening 9b are started to be exposed.

When the cartridge B moves to the inner side in accordance with the closing operation of the open/close cover 15, the cam portion 12d of the shutter 12 comes into contact with a corner part of the optical plate 1f. Thereafter, as shown in Fig. 14, the shutter 12 moves while abutting a top portion 12d1 of the tip of the cam portion 12d against a lower surface of the optical plate 1f.

The cartridge B moves down to a conveying frame side, the shutter 12 increases its opening angle.

Then, as shown in Fig. 20, the movement of the moving guides 41 associated with the rotation of the open/close cover 15 stops at a point when an opening amount of the open/close cover 15 has reached S. When the movement of the cartridge B following the movement of the moving guides 41 ends, the shutter 12 opens at a predetermined opening angle to expose the transfer opening 9a and the exposure opening 9b. Consequently, the cartridge B is brought into a state in which an image forming operation is possible.

Operations and mechanisms at the time when the cartridge B is inserted in an unconformable main body of an apparatus will be hereinafter described.

(Mounting of the process cartridge to an improper main body of an apparatus)

Next, an erroneous insertion preventing operation according to an erroneous insertion preventing mechanism in inserting the cartridge B in an main body 114 of an apparatus with different functions in view of an image forming speed or the like will be described with reference to Fig. 21.

In other words, it describes about the case that the cartridge B is inserted into the main body 114 of the apparatus which is an unconformable in functions of the cartridge B and having different functions.

A structure of the main body 114 of an apparatus with functions different from those of the main body 14 is substantially identical with that of the main body 14 of the apparatus A except the following points.

In the main body 114 of an apparatus, side guides 143b of the front guide 43 arranged below the opening W are larger than the side guides 43b of the main body 14 (see Fig. 21).

When the cartridge B is inserted into this main body 114 of an apparatus, the projecting portions 10f4 of the cartridge B abut against the side guides 143b serving as a main body frame before the cartridge B is mounted in a predetermined position. Thus, at this point, the insertion ends in the vicinity of the opening W (Fig. 21). Here, the projecting portions 10f4 abutting

against the side guides 143b may have a structure in which both ends thereof in the longitudinal direction abut against the side guides 143b or may have a structure in which one of both the ends abuts against the side guides 143b. That is, at least one end abuts against the side guides 143b.

(Mounting of an improper process cartridge to a proper main body of an apparatus)

Next, an erroneous insertion preventing operation in inserting an improper process cartridge C into the main body 14 of the apparatus A will be described with reference to Fig. 22.

The cartridge C is different from the cartridge B in that the projecting portions 10f4 are not provided and leg portion 10f31 on the drive side is larger than the leg portion 10f3 and does not have a forked shape.

When the improper cartridge C is inserted into the main body 14 of the apparatus A, the leg portions 10f31 of the cartridge C abut against the side guides 43b of the main body 14 of the apparatus A before the cartridge C is mounted in a predetermined position. Thus, at this point, the insertion ends in the vicinity of the opening W (Fig. 22).

In addition, the cartridge C does not include the projecting portions 10f4 and is not guided by the side guides 43b. Therefore, the positioning of the cartridge C cannot be performed when the cartridge C is inserted. Consequently, a method of recognizing that the cartridge C is improper and stopping the insertion in the vicinity of the opening W can also be adopted.

The above-mentioned embodiment is summarized as described

below.

The cartridge B detachably mountable to the main body 14 of the electrophotographic image forming apparatus A having the guide member (side guides 43b), includes: the cartridge frame CF; the electrophotographic photosensitive drum 7; the process means (the charging roller 8, the developing means 10, the cleaning means) acting on the electrophotographic photosensitive drum 7; and the projecting portion 10f4 which is provided in the cartridge frame CF and, when the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A, is guided to the guide member (side guides 43b) to guide the process cartridge B in a mounting direction in which the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A, in which, when the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A which is conformable in functions of the process cartridge, the projecting portion 10f4 allows the process cartridge B to insert the main body 14 of the electrophotographic image forming apparatus A and, when the process cartridge B is mounted to the main body 114 of an electrophotographic image forming apparatus which is unconformable in functions of the process cartridge B and having different functions, the projecting portion 10f4 abuts against the main body frame (side guide 143b) provided in the main body 114 of the electrophotographic image forming apparatus having the different functions to prevent the mounting of the process cartridge B.

In addition, the projecting portion 10f4 includes: a first

projecting portion (10f4a) which is provided on one end side of the cartridge frame CF in a longitudinal direction of the process cartridge B and, when the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A, abuts against the guide member (side guides 43b); and a second projecting portion (10f4b) which is provided on the other end side of the cartridge frame CF in the longitudinal direction and, when the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A, abuts against the guide member (side guides 43b), and when the process cartridge B is mounted to the main body 114 of the electrophotographic image forming apparatus which is unconformable in functions of the process cartridge and having different functions, at least one of the first projecting portion 10f4a and the second projecting portion 10f4b abuts against the main body frame (side guides 143b) provided in the main body 114 of the electrophotographic image forming apparatus having different functions to prevent the process cartridge B from being mounted thereto.

In addition, the projecting portion 10f4 is provided so as to project downward from the cartridge frame CF when the process cartridge B is mounted to the main body 14 of the electrophotographic image forming apparatus A.

In addition, one of the first and second projecting portions 10f4a and 10f4b is provided on the outer side in the longitudinal direction of the leg portion 10f3 (10f3a, 10f3b) provided in the cartridge frame CF in order to support the process cartridge B when the process cartridge B is mounted on the mounting surface.

In the above-mentioned respective cases, a cartridge can be recognized as an improper cartridge as insertion thereof ends.

Note that the above-mentioned main body of the apparatus with different functions is different not only in an image forming speed. For example, it is possible that a memory is mounted on the cartridge B and the main body of the apparatus is different in that it has or does not have a function for capable of receiving transmission of memory information thereof.

With the above-mentioned structure, according to this embodiment, a shape of the leg portions 10f3 formed at longitudinal ends of the cartridge B and provision of the projecting portions 10f4 on the outer side of the leg portions 10f3 easily make it possible to prevent erroneous insertion of the cartridge B into an improper main body of an apparatus (non-interchangeability) by only changing the parts at both ends in the longitudinal direction of the cartridge B.

In addition, in the case of erroneous insertion of the cartridge B into an improper main body of an apparatus, the insertion ends in the vicinity of an entrance of an opening of the apparatus main body (prevention of erroneous insertion) and the open/close cover does not close. Therefore, an improper relation between the parts is made clear to a user at an earlier stage. Consequently, improvement of usability can be easily realized.

Further, it becomes possible to divert a manufacturing process and a packing material without changing structures of frames of other process cartridges.

According to the above-mentioned embodiment, a projecting

portion is provided at ends in a longitudinal direction of a process cartridge, and guide member corresponding to the projecting portion is provided in a proper main body of an electrophotographic image forming apparatus corresponding to the process cartridge. Consequently, a smooth cartridge inserting operation is realized.

In addition, even if the process cartridge is caused to be inserted in an improper main body of an electrophotographic image forming apparatus having different functions and not corresponding to the process cartridge, the projecting portion abuts against a main body frame of a main body cartridge insertion port of the main body. Thus, the process cartridge cannot be inserted further at that point, whereby erroneous insertion is prevented.

In addition, even if an improper process cartridge is caused to be inserted in the proper main body, the cartridge abuts against guide member of a main body cartridge insertion port of the main body. Thus, the process cartridge cannot be inserted further at that point, whereby erroneous insertion is prevented. Alternatively, the improper process cartridge is not guided by the guide member. Thus, positioning of the process cartridge cannot be performed at the time of insertion, whereby erroneous insertion is prevented.

Further, the first projecting portion and the second projecting portion are provided in a component arranged at longitudinal ends separately from the frame forming the central part of the process cartridge.

With the above-mentioned structure, non-interchangeability (corresponding to prevention of erroneous insertion) is realized

without changing a size of a frame of a process cartridge. In addition, diversion of a process for a process cartridge assembly is facilitated, and even diversion of a package of the process cartridge can be realized easily.

In addition, according to the above-mentioned embodiment, at least one kind of frame (case) for plural kinds of process cartridges can be manufactured as a common component.

Further, since a difference in structures of process cartridges with different specifications is only presence or absence of a structure provided with a projecting portion at ends in the longitudinal direction of the process cartridge, diversion from the conventional structure can be easily performed.

Since a difference in structures for insertion of a process cartridge of apparatus main bodies is only that shapes of a guide member of the main bodies is adapted so as not to prevent insertion of a proper process cartridge. Thus, only when a process cartridge is mounted to the main bodies, the cartridge can be mounted in a predetermined position smoothly without any hindrance.

In addition, when an improper process cartridge is caused to be mounted, a leg portion of the cartridge abuts against a guide member of the main body. Therefore, the cartridge can be judged as improper.

Thus, reliable non-interchangeability can be given to the main body and the cartridge at relatively low cost without involving a large change in shapes in the main body and the cartridge. In addition, an open/close cover of the main body cannot be closed. Therefore, improvement of usability can also be realized easily.

In other words, non-interchangeability can be given to the main body and the cartridge, and this non-interchangeable shape also functions as inserting guide. In addition, manufacturing cost can be reduced by sharing components including a frame (case) of a cartridge. Further, it is unnecessary to adopt useless means such as a sensor for judgment for giving interchangeability as in the past. Thus, not only the process cartridge but also the main body of the apparatus is not complicated in structure. From this point, there is also an effect that manufacturing cost can be reduced.

In addition, diversion of the conventional (wide variety of) assembly processes and assembly apparatuses becomes possible, and diversion of packing forms also becomes possible.

As described above, the process cartridge and the electrophotographic image forming apparatus of the present invention can be provided with non-interchangeability with a simple structure.

While the invention has been described with reference to the structure disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purpose of the improvements or the scope of the following claims.